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East Europe Report

SCIENTIFIC AFFAIRS

No. 719

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WEST GERMAN STUDY: ILLEGAL TECHNOLOGY TRANSFER TO CEMA CONTINUES

Zurich NEUE ZUERCHER ZEITUNG in German 12 Sep 81 p 16

[Unattributed article: "Flourishing Illegal Technology Transfer in CEMA--East Interested in Computers and Microelectronics"]

[Text] As revealed in a report from the research office for all-German economic and social questions in Berlin, in spite of the narrowing of the technological gaps between East and West in EDP and microelectronics the interest of the communist countries in these developments has not diminished. Sensing increased illegal East-West exports of technology, especially in the sector of microelectronics, consideration is now being given in Paris to expanding the embargo list of the Committee for Coordinating East-West Trade (Cocom).

East European Push to Imitate

In the course of time four different forms of technology transfer have developed: Computer purchases, including peripheral equipment and software within the framework of normal trade relations between East and West; licensing of CEMA companies by EDP manufacturers; establishment of joint ventures for the production and sale of EDP products, as, for example, ROM Control Data in Romania; illegal technology transfer.

In addition, adaptation and adoption of Western technology were likewise successfully practiced by CEMA countries. Thus, it is not by chance that the two lines of development of the common CEMA computer families of the uniform electronic data processing system (ESER), in the West often known also by the Russian term ryad, show similarities with the IBM 360 and 370 systems.

Following the introduction of their first universal computer families, ESER 1 (since 1972-1973), the strategy of the CEMA countries became clear: By adapting and adopting hardware and software of the EDP technology of IBM, the leader in the Western market, their own basic research and development could be supported, pushed forward and be freed of possible faulty developments. ESER 1 involves imitating the IBM 360 system which, however, was still modernized to some extent. Thus, from the memotechnical code of the assembly instructions to the channel system and the peripheral equipment, the entire ESER is compatible with IBM which not least made the use of the corresponding IBM software easier. Hungary's ESER model EC 1010 was the only exception to this.

The ESER development series 2, in series production since 1978-1979, is extensively identical with the IBM 370 system. The only exception is the Soviet large computer EC 1065 which is said to be comparable to the IBM 3033 system. Thus, CEMA development engineers of the ESER can also use the software of the IBM 370 and 3033 systems to their advantage to the extent they can get at them.

Since the beginning of the 1980's research and development work for the new series 3 of the ESER (ryad 3) has been in progress; production is planned to start in 1982-1983. Certainly this series of models will also be designed in such a way that at least the capabilities of Western technologies can be used.

Progress With Western Help

In the past few years most of the CEMA countries have developed miniature and microcomputers which, meanwhile, are now also being series produced. The no doubt most obvious characteristic of some of these computers is the fact that they contain components from Western firms and that components and equipment are produced with Western licenses. The reason for recourse to proven Western technology, an action acknowledged in part in customer information brochures, is the fact that such CEMA products are to be sold mainly in Western markets in order to yield foreign exchange. But even when used in their own countries, computers equipped with Western chips must demonstrate scientific-technical progress in socialism. CEMA's miniature computer families (system of miniature computers, abbreviated SKR), are based in part on the systems of Hewlett-Packard and Digital Equipment Corp.

Using Western findings is likewise characteristic of the microelectronics sector. Nevertheless, CEMA did not initiate establishment of its own microelectronics industry until later than in the West. In the GDR, for example, there was no reference to microelectronics either in the directive to the 1976-1980 Five-Year Plan nor in the approved text of the 5-year plan. Not until June 1977, by means of a resolution at the sixth meeting of the Central Committee, was acceleration of the rate of development in this industrial branch set forth because of the overall economic importance of microelectronics, and the first basic steps were taken. In order to keep the West's headstart in development, which had meanwhile been moving forward, from getting any bigger, research in the GDR was extensively oriented to the proven findings of leading U.S. chips producers as, for example, Texas Instruments or Itel. The purchase of Western technology was, of course, costly, yet as a rule never involved difficulties of any magnitude. According to a report in the February 1981 party newspaper NEUES DEUTSCHLAND, users in the GDR have "access to an assortment of 719 types of components, including 210 integrated circuits.

Capitalists as Stopgaps

In the USSR, according to a report in PRAVDA, 3 November 1980, "hundreds of thousands of microprocessors in 10 types, thousands of microcomputers and millions of other microcomputers in 13 types" were produced in 1980. Even in other CEMA countries series production of integrated circuits has been under way for some time. In spite of these production successes, however, the existing gaps in the East must continue to be filled by the "capitalists."

In spite of the Cocom embargo list, which prohibits exporting certain computers and microelectronics, the illegal technology transfer from West to East is flourishing. The NATO regulations could, of course, be thoroughly circumvented by resourceful businessmen. The FRG in particular does not take observance of the regulations too seriously.

Beyond Legality

Thus, for example, there is a number of companies both in Berlin and in the rest of the FRG which function as initiating institutes for exporting technology to the East. American technology was sold to the Soviets via the FRG. Key components for missiles and satellites as well as small flight computers are said to have been among the Western knowledge sold. Of course, it is completely legal to buy such components in the United States, but not to go on to sell them to the USSR. Naturally the Russians participate very actively in the technology sellout. The Soviet secret service supports an extremely thoroughly organized network of European businessmen in the United States who purchase highly developed technology for Moscow in a systematic way. In addition, according to American statements, Soviet students have sought out very interesting fields of study at American universities, for example, fields in the electronics sector, and, thus, in this way they gain access to important scientific-technical findings.

Obviously even U.S. businessmen are ready to serve the Soviets if the price is "right." In the course of a routine investigation a ship's cargo with extremely efficient components, including combat computers and technology for battle with and by helicopters, was seized by the customs authorities in California. The containers with the products mentioned had already been loaded onto the Russian freighter, and according to the manifest they ostensibly contained washing machines and electric ranges. Irrespective of the political developments in recent times, even well-known American companies are seeking, partly in concert with their Soviet business partners, ways to circumvent existing export barriers.

However, the American export ban on high quality technology to the USSR following the intervention in Afghanistan does seem to have had an effect. The American behavior has been repeatedly deplored by prominent Soviet scientists.

12124
CSO: 2302/10

REPORTS, COMMENTS, DESCRIPTION OF 'INTERKOSMOS-BULGARIA 1300' SATELLITE

Interkosmos-Bulgaria 1300 Satellite in Orbit

Sofia RABOTNICHESKO DELO in Bulgarian 8 Aug 81 pp 1,6

[BTA Report]

[Text] Moscow, 7 August. Today the Interkosmos-Bulgaria 1300 satellite was fired into orbit. The satellite's main purpose is the continuation of comprehensive studies of physical processes occurring in the earth's ionosphere and magnetosphere.

The satellite's orbit has the following parameters:

Maximal distance from the earth's surface (apogee), 906 km;

Minimal distance from the earth's surface (perigee), 825 km;

Orbital inclination, 81.2°;

Initial orbital period, 101.9 minutes.

The scientific equipment installed in the satellite was developed and manufactured by Bulgarian scientists with the help of Soviet scientists. Its purposes are the following:

Study of the ionospheric plasma and high-energy flows of charged particles;

Study of direct and alternating electric magnetic fields;

Study of the light in the upper atmospheric strata in the ultraviolet and visible range of the spectrum.

In addition to the scientific equipment, the Interkosmos-Bulgaria 1300 satellite contains the following: A system ensuring a permanent orientation of the satellite toward the earth; a system for electric supplies with autonomous orientation of the solar batteries toward the sun; a radio system for precise measurement of the orbital elements and a radiotelemetric system which transmits to earth data on the work of the satellite's equipment.

According to telemetric measurement data, the systems aboard the satellite are operating normally.

The earth stations of the command-measurement complex of the Soviet Union are regularly receiving the scientific data transmitted by the satellite.

The data will be processed and analyzed by scientific organizations in the Soviet Union and the Bulgarian People's Republic.

Warm Congratulations

Sofia RABOTNICHESKO DELO in Bulgarian 8 Aug 81 p 1

[BTA Report]

[Text] Moscow, 7 August (Tass). Leonid Brezhnev warmly congratulated Todor Zhivkov on the occasion of the remarkable event: the launching of the Interkosmos-Bulgarian 1300 satellite.

Todor Zhivkov expressed his warm thanks for the opportunity to participate in joint studies of outer space.

Remarkable Bulgarian Achievement

Sofia RABOTNICHESKO DELO in Bulgarian 8 Aug 81 pp 1,6

[Article by Dimitur Gornenski, RABOTNICHESKO DELO special correspondent]

[Text] Moscow, 7 August. Report from a Soviet cosmodrom.

This was a happy day for anyone who had the opportunity to witness the launching into the blue sky of Interkosmos-Bulgaria 1300, the latest man-made star. As the project of Bulgarian and Soviet scientists and specialists, with this launch it entered the history of space research as a remarkable achievement of our science: for the first time a space apparatus entirely equipped with a variety of instruments for complex and precise measurements and experiments developed and created by a big collective of researchers of the Central Laboratory for Space Research and other Bulgarian scientific centers is circling the earth.

The star began to shine brightly with the powerful light of the rocket engines against the background of a beautiful Russian forest. It crossed the horizon of this huge country and rose above the launching field to follow the trajectory computed by the daring, skill and faith of dozens of its creators. The rocket launch was brilliant. When the order "take off" was issued at the command center, I glanced at our cosmonaut Engineer Col Georgi Ivanov, who was standing on the special guest platform. He was tensely waiting for the supreme moment and was probably reliving the time of his own launching into space together with Nikolay Rukavishnikov aboard the Soyuz-33 Soviet spaceship which was launched into orbit with the same type of rocket.

Present at the cosmodrom, decorated with slogans in the Bulgarian language, were noted Soviet scientists and designers and Bulgarian specialists.

Also present was a Bulgarian delegation headed by Ognyan Doynov, Politburo member and BCP Central Committee secretary.

The excitement of the guests lasted a long time. The engines brightly lit up and the powerful rocket smoothly rose over the launching pad. Two minutes later the first stage separated and a light, bright cloud hung over us. All the eyes followed the trajectory of the bright light rising in the distance. About 250 seconds after the launch, the report was heard that the second stage had separated. The brilliant dot was no longer visible in the air but the numerous guests remained silent, waiting for subsequent reports. When the loudspeaker reported that "The flight is proceeding normally. There is separation of the third stage!" applause broke out and there were firm handshakes, embraces and kisses, exclamations and expressions of unconcealed joy. Interkosmos-Bulgaria 1300 was starting its first orbit around the earth.

I remembered at that time the infinitely interesting hours of the last preparations for the launch. In the morning, in the company of a group of Bulgarian and Soviet scientists, we visited the launching area. The huge rocket was standing in front of us in the sunlight. The letters "Interkosmos-Bulgaria 1300" were visible on its second stage and the letters "USSR" were on the orange-colored third stage. There, at the top, with its brilliant silvery metal cover, was the concealed satellite of the "Meteor" type with a number of improvements, containing the 12 scientific instruments of the first part of the Bulgaria 1300 space research program. Later, together with the developers, we saw the duplicates--a multicolored series of apparatus, many of which are considered by the Soviet specialists as one-of-a-kind achievements of Bulgarian scientists, designers and engineers. My interlocutors frequently stressed that any advanced country in the field of space research of the ionosphere, magnetosphere and earth's atmosphere as well as other areas of space close to our planet could be proud of such a set of precise instruments. More specifically, so far such programs have been implemented or designed only by the Soviet Union, the United States, France and Italy. In this very small circle, Bulgarian science is entering with its own program which so far has been rated exceptionally highly by the most prestigious Soviet experts. The implementation of this program was approved by a special commission which did not issue a single remark. The most fitting expression in this case is that "No comment is needed."

The launching of the new satellite and its normal start is a success which dates back to 10 July when the Meteor-Priroda satellite equipped with a set of scientific research instruments developed by Bulgarian and Soviet scientists was launched as the second part of the Bulgaria 1300 research program. Such brilliant starts mark our great 13-century anniversary of the founding of the Bulgarian state. However, they also crown the peaks reached by our homeland in the course of the building of socialism, thanks to the tremendous fraternal and selfless support of the USSR. The Bulgarian scientists and specialists conquered these heights thanks to their joint work with the collectives of a number of Soviet scientific centers, plants and auxiliary organizations. Both spaceships were launched in orbit with the help of the tested Soviet space technology and from Soviet cosmodroms. In the course of the 2 years of selfless labor for the implementation of the Bulgaria 1300 space research program, not only scientists, engineers and technicians from the main areas engaged in the study and utilization of outer space in our country were involved but workers and specialists of many industrial enterprises in Sofia, Plovdiv, Stara Zagora, Kazanluk, Panagyurishte and other cities.

Actually, the implementation of this program is the project of a thousands-strong collective of Bulgarian and Soviet scientists, designers, engineers and workers, described by Comrade Todor Zhivkov in the course of his participation in the procedings of the 26th CPSU Congress and his meeting with the collective of the Institute of Space Research of the USSR Academy of Sciences as the "powerful Soviet-Bulgarian scientific research complex."

That is what is hidden behind the inscriptions on the rocket which, in today's sunny afternoon, took into orbit the bright star of our friendship, love for and brotherhood with the Soviet people and which, together with the Meteor-Priroda, will yield important results for the further development of basic research and the solution of many practical national economic problems in which the entire world is tremendously interested.

Professor Comments on Interkosmos-Bulgaria 1300 Flight

Sofia RABOTNICHESKO DELO in Bulgarian 8 Aug 81 pp 1,6

[Article by Corresponding Member Prof Dr Kiril Serafimov, scientific observer for RABOTNICHESKO DELO]

[Text] The idea of the development of a new space project belongs to a few enthusiastic Bulgarian specialists who suggested to Academician B. N. Petrov (the then-chairman of the Interkosmos Council) in 1975 the creation of a satellite for the study of plasma, electromagnetic and optical manifestations of magnetospheric-ionospheric interaction. In 1977 the Bulgarian scientists submitted this original space project for discussion. This marked the beginning of a profound joint discussion held by Bulgarian and Soviet collectives and of the improvement and implementation of this space project whose essential scientific significance consists, above all, of the aptly-selected study target--magnetospheric-ionospheric interactions and reciprocal influences.

The study of magnetospheric-ionospheric interaction is interesting above all from the basic-cognitive viewpoint in learning about the phenomena, processes and physical characteristics of space around the earth. Such studies are quite important also from the viewpoint of plasma physics, for plasma processes are taking place in the magnetosphere and ionosphere in a free, noncontained aspect which is difficult to duplicate under laboratory conditions. Finally, magnetospheric-ionospheric interactions are the most important and understudied segment of the tremendous bridge of life which links the sun with the earth.

The main idea of the experiments and of the instruments aboard the Interkosmos-Bulgaria 1300 satellite is the study of an optimal number of basic and determining parameters and values in the two interacting media--the magnetosphere and ionosphere--as well as their reciprocal influences through electrical and magnetic fields and transfer of matter. Bearing in mind the spatial separation of the basic areas of interaction, it is very difficult for a single satellite to carry out this task. For example, in the current Dynamic-Explorer American program, similar problems are being resolved by two satellites, one of which follows a very flat elliptical orbit. A different and original system for determining the parameters of interaction was chosen for the Interkosmos-Bulgaria 1300 satellite. The electrical connections between the two media and the exchange of energy and matter between them are measured at ionospheric altitudes. The quantitative evaluation of the processes and phenomena taking place in the magnetosphere is based on their effect on the ionosphere, thus making the use of a second satellite unnecessary.

In order to resolve the scientific problems, a set of satellite instruments, which includes four groups of a total of 12 systems, apparatus and installations, was designed and manufactured in Bulgaria. Many of the new methods, technologies, elements, means, inventions, solutions and other developments which led to the original equipment for the satellite may be applied in industry and other practical areas with a high degree of effectiveness.

The fact that during that period four other satellites will be functioning, pursuing almost simultaneously similar or complementary objectives and tasks, is of great importance. They include two American satellites, the Arcade French-Soviet satellite and the San Marco Western European satellite. This offers great opportunity for the development of international space cooperation which, in addition to its scientific value, can also be a factor for peace and detente on earth.

This major space project is the result of the successful development of a number of basic scientific and technical and industrial fields in socialist Bulgaria, such as electronics, electrical engineering and machine building. The Bulgarian-Soviet space collective is dedicating its new great space success to the 13 centuries of existence of the Bulgarian state. This satellite marks the final stage of the implementation of the comprehensive Bulgaria 1300 space project, in the course of which several Bulgarian systems and apparatus were used on the Meteor-Priroda Soviet satellite, which was launched on 10 July 1981.

The new joint space flight is yet another brilliant manifestation of Bulgarian-Soviet friendship and fruitful scientific and technical cooperation in space. Bulgarian scientists and specialists learned from Soviet science. They were trained or practiced in the Soviet Union. They drew ideas and information from their Soviet colleagues and received a number of consultations, material and technical assistance and the exceptional opportunity to use the latest Soviet laboratories and technological testing and other equipment. The Soviet experience in organizing, directing and controlling major scientific and technical space collectives working on big target programs was particularly useful.

The attention and energetic support of the BCP Central Committee and CC CPSU and, particularly, the personal concern of Comrade Todor Zhivkov, BCP Central Committee general secretary and State Council chairman had a great stimulating influence and played a main role in the successful implementation of this space project. In the course of Todor Zhivkov's visit to the USSR, where he attended the 26th CPSU Congress, he was shown the final assembly and testing operations of the satellite.

The friendship and joint efficient and fruitful organization of the scientific and technical groups of the two fraternal countries in charge of implementing the program strengthened in the course of work on the Bulgaria 1300 space project. One of the main results of the implementation of the Bulgaria 1300 space project, which can be reported now, was the development of a large and highly skilled Bulgarian-Soviet space collective which can resolve difficult contemporary space scientific and technical problems.

The new joint satellite proves to the world the great scientific and technical, economic and comprehensive achievements of a small and formerly backward country--Bulgaria--which under the conditions of socialism and fraternal friendship with the Soviet Union, is now confidently assuming its place in the leading ranks of mankind's offensive in outer space.

Reliable Equipment Created

Sofia RABOTNICHESKO DELO in Bulgarian 8 Aug 81 p 6

[Article by Stanislav Kolev, RABOTNICHESKO DELO special correspondent, Stara Zagora]

[Text] There is restlessness in the silent beauty of the V. I. Lenin park near the city. A particular kind of "magnetic" field, which draws the efforts and energy of construction and scientific workers and the hopes and expectations of every Bulgarian has developed near the silvery dome of the Yuriy Gagarin base laboratory of the Central Laboratory for Space Research of the Bulgarian Academy of Sciences. The reason is that soon the first signals sent by the Soviet satellite, which is already flying in space, bearing the name of our centuries-old state, will be heard here soon.

In the "breathless" hours of the final preparations, I met with Senior Scientific Associate and Candidate of Physical Sciences Mitko Gogoshev, head of the collective: "The tasks which will be performed by the Bulgaria 1300 satellite are part of the Interkosmos program. The satellite contains 12 Bulgarian-manufactured apparatus through which the 'arc' experiment, undertaken aboard the Soyuz-33 by Col Georgi Ivanov, will be continued. Most of this equipment was designed and developed by our collective. Some of the instruments for the reception, recording and processing of expected data were also created by us. The two-column scanning EMO-5 electrophotometer was developed under the direction of Engineer Neno Petkov; the Proton-1 proton spectrometer was manufactured by a team headed by Kol'o Kazakov; the vacuum ultraviolet scanning spectrometer was developed by scientific associate Stoyan Surgoychev and his associates. However, we do not deserve the entire credit, for this equipment was prepared with the active help of our colleagues in the Soviet Union and the cooperation of the Beroe and Cherveno Zname memory systems plants in Stara Zagora.

All of us were waiting for the flaming start of the carrier rocket. It was awaited by scientists and specialists at the Yuriy Gagarin observatory, whose minds and actions were focused on the secret of starry space. It was awaited by academicians, miners and rural workers, for it will provide new opportunities for our national economy! It was awaited by the construction workers of the brigade headed by Georgi Atanasov, with technical manager Raycho Banov, of the second construction rayon in Stara Zagora. These masters, who had so far built factories, plants, schools and houses, had now built the first space center of the homeland. In a few days its antennas will be receiving the initial signals of the Bulgaria 1300 satellite which will calmly record yet another major step taken along our socialist path and once again with the fraternal aid of the great land of the soviets.

Integration Project

Sofia RABOTNICHESKO DELO in Bulgarian 8 Aug 81 p 6

[Text] Interkosmos-Bulgaria 1300 is orbiting the earth. The news of its launching triggered the enthusiasm and gratitude of the entire nation. They were specifically addressed to our scientists who, within a relatively short time, were able to develop scientific systems and apparatus for this satellite.

The news of the launching of Interkosmos-Bulgaria 1300 satellite was received by the people as yet another convincing manifestation of comprehensive Bulgarian-Soviet cooperation. The service systems and the hull of the satellite, which are the vivid embodiment of its constructive force, are the work of the skill, ambition and creative efforts of Soviet engineers, mechanics and workers.

Interkosmos-Bulgaria 1300 is a phenomenon of great national importance. It is a new brilliant confirmation of socialist integration in the study of outer space and a major success of Bulgarian electronics, electrical engineering and machine building. Formerly neglected agricultural Bulgaria is today among the technically advanced countries and is a convincing example of the possibilities and prospects of our progress toward developed socialism.

The thought that modern Bulgaria is making its contribution to the conquest of space and to the utilization of the results of space research for peaceful purposes triggers the patriotic pride of everyone. It increases our love for the Soviet Union and supports our infinite faith in progress.

5003
CSO: 2202/20

OBJECTIVES OF 'INTERKOSMOS-BULGARIA 1300' SATELLITE OUTLINED

Sofia OTECHESTVEN FRONT in Bulgarian 18 Aug 81 p 1

[Article by Yuriy Zaytsev, department head, USSR Academy of Sciences Institute of Space Research: "The Ionosphere-Earth Bulgarian-Soviet Bridge"]

> [Text] Advantages of the "Interkosmos-Bulgaria 1300" program; the experiments are focused on the study of upper atmospheric strata--one of the main tasks of the science of earth.

Moscow. Special for OTECHESTVEN FRONT

We are witnessing the successful implementation of a new comprehensive space program drafted by Bulgarian and Soviet specialists for the Interkosmos-Bulgaria 1300 satellite. The main purpose of the project is to obtain data which will make it possible to unravel the secret of the transfer of energy from the sun to the earth through time and space.

The mystery of our sun has long excited not only astrophysicists. The tremendous plasma processes taking place on the sun (spots, eruptions and so on) characterize so-called solar activities and influence the condition of the magnetic field and the atmosphere on earth.

The structure of the ionosphere changes constantly under the effects of solar radiation. In turn, this also means a change in the conditions governing the penetration of solar energy down to the earth's surface. Many secrets of nature, related to shaping the weather and climate on our planet, are concealed in the ionospheric processes. Furthermore, in the ionospheric plasma radio waves cannot spread as freely as in the air. In the plasma they are absorbed and refracted. These processes are directly related to the condition of the ionosphere and to its characteristics. The study of ionospheric dynamics helps us to surmount difficulties in establishing long-range radio communications.

In turn, the physical processes which take place in the ionosphere are closely related to and largely determined by phenomena in more distant areas of space around the earth, in its magnetosphere. The study of such processes requires the measurement of electric and magnetic fields and of flows of vast charging particles. It is also important to record the aurora borealis which are caused by the penetration of such particles into the atmosphere and the ionosphere. Therefore, it is a question of conducting comprehensive studies and comprehensive experiments. Such is precisely the program being implemented aboard the Interkosmos-Bulgaria 1300 satellite.

We must emphasize that this program offers a number of advantages compared with previous similar programs.

Above all, such measurements are taking place in a period of increased solar activity. Never before have such broad studies been conducted with the help of scientific equipment developing on the basis of a single program. Thirteen instruments have been mounted aboard the satellite, 12 of them, including the laser angle reflector, are of Bulgarian manufacture.

The planned duration of the active life of the satellite will enable us to make measurements in the different seasons of the year and with different variations of the shady part of the orbit and different positions of the orbit in terms of the sun-earth axle.

The high precision of the satellite's orientation, combined with an advanced system and guidance control, will ensure the high quality of the received data.

Bulgarian space science reached the beginning of the Interkosmos-Bulgaria 1300 satellite program with a solid scientific package. Bulgarian scientists participated in all the aspects of the studies based on the Interkosmos program, such as direct measurements from satellites and rockets, ground measurements and theoretical research. Bearing in mind the existence of relatively strong ionospheric and space radiation research groups in Bulgaria and the developed state of Bulgarian electron, electrical engineering and optical industry, priority was given to space physics and space instrument manufacturing. The Bulgarian specialists are high-grade specialists in ionospheric and magnetic studies in space research. That is why it is natural that the experiments they prepared were focused mainly on the study of the upper strata of the earth's atmosphere, which are ionized and are known as the ionosphere.

In the course of joint work on the Interkosmos program, Bulgaria developed highly skilled specialists who are successfully creating complex scientific equipment for space research.

Bulgarian-Soviet cooperation in the conquest of space is a natural extension of the traditional fraternal relations between the Russian and Bulgarian peoples. Unquestionably, such relations will be strengthening and developing with every passing year.

5003
CSO: 2202/21

ADDITIONAL DETAILS ON TASKS OF 'INTERKOSMOS-BULGARIA 1300' SATELLITE

Sofia TEKHNICHESKO DELO in Bulgarian 15 Aug 81 pp 1,7

[Article by Senior Scientific Associate Candidate of Physical Sciences Engineer Stefan Chapkunov, director of the Interkosmos-Bulgaria 1300 Ionospheric-Magnetospheric Project: "The Ionospheric-Magnetospheric Project"]

[Text] A project is born like a person: there is an incubation period, pain and... happiness. "Bulgaria 1300 was the result of the growing space activities of the Central Laboratory for Space Research (TsLKI) of the Bulgarian Academy of Sciences: five different instruments for the study of space around the earth with the help of vertical heavy rockets and artificial satellites were developed in 1978 alone; ten such instruments and systems were developed in 1979 (!). Two of them were for use in outer space by the first Bulgarian cosmonaut.

TsLKI has long been involved with studies of the ionosphere. As early as 1961 its director, Corresponding Member Prof Kiril Serafimov, began to work on methods for the study of the electrified segment of the air. In the course of its decade of existence the TsLKI has developed as a specialist in direct sounding methods in the immediate outer space and has acquired the "monopoly" on the study of natural atmospheric optical emissions through direct instruments mounted on rockets and satellites. The ionospheric-magnetospheric project, which has been carried out through the Interkosmos-Bulgaria 1300 project, is a new qualitative stage in the development of our young space science. Its first significant accomplishment was the acknowledgement of Bulgaria as the 18th space country in the world, after the first Bulgarian instrument P-1, used for combined studies of structural plasma parameters around the satellite, was mounted on the Interkosmos-8 satellite, which was launched on 1 December 1972.

The project consists of 12 Bulgarian-made instruments and systems whose work and functions make possible total studies of the most important parameters and characteristics of the track followed by the Interkosmos-Bulgaria 1300 satellite.

The experiments planned for the active life of the satellite may be arbitrarily classified as follows:

Wave measurements, which include studies of the electrostatic field (including its low-frequency changes in the 20 hertz-20 kHz range) and definition of the vector of the constant magnetic field with a level of accuracy unattained previously in the Interkosmos program;

Structural plasma measurements. Electron and ion concentrations (local values) and temperatures are determined; the ion mass structure is partially defined and so is the drift of the ion plasma component;

Natural optical atmospheric emissions in the visible and ultraviolet areas of the spectrum;

Study of greatly accelerated electrified particles, such as electrons, protons and ions. The studies cover partial concentrations, energy spectrum and mass structure (of the accelerated ion component);

Geodetic and geophysical problems, which are resolved with the use of a passive laser "reflector" system mounted on the "arc" of the Interkosmos-Bulgaria 1300 project (developed by the Bulgarian Academy of Sciences Central Laboratory for Higher Geodesy, Prof Dr Nikolay Georgiev, director).

All of these experiments are mutually complementary and allow the comprehensive study of the environment in which the satellite is orbiting. It is indicative that similar problems were assigned to the American Dynamic Explorer Project, which is taking place through two satellites covering almost entirely the time of operations of the Interkosmos-Bulgaria 1300.

The readers of this newspaper will probably be interested to know some of the characteristics of the satellite on which Bulgarian scientific equipment is mounted. It is of the famous Meteor type. These satellites are specifically designed for meteorological observations. On the basis of a standard carrier, the Soviet designers have developed a technological research masterpiece which meets all modern requirements of experimental physicists. The satellite is entirely metal-plated, including the solar battery panels which, when spread, have an impressive size: 17 linear meters (!). This heavy satellite (weighing more than 1.5 tons!) is amazingly elegant and functional. It is equipped with numerous fixed deploying and telescopic rods which give it the aspect of a strange hedgehog. The satellite has an amazing level of stabilization along its three main axles.

The basic problem of complex satellites of the Interkosmos-Bulgaria 1300 type is the electromagnetic compatibility of the individual instruments and systems. Let me emphasize that in this case a specialized Soviet institute participated in the stage of the comprehensive tests conducted by the USSR Academy of Sciences Institute of Space Research and at the manufacturing plant, with a view to the objective assessment of electromagnetic compatibility. The compatibility proved to be incredibly good in this type of scientific space system.

Now, when the flight of the Interkosmos-Bulgaria 1300 satellite is a fact, we must express our sincere gratitude to the Central Committees of the BCP and the CPSU, which decided to implement the Bulgaria-1300 space program, which includes two satellites: one for ionospheric-magnetospheric studies and one for the study from outer space of natural resources, with the help of the Interkosmos-Bulgaria 1300 and the Meteor-Priroda satellite. The decision led to scientific and technical developments of a big Bulgarian-Soviet scientific and technical collective and to the implementation of the two Bulgarian projects as planned.

The main part of the Bulgaria-1300 program lies ahead: the reception, processing and interpretation of the scientific data supplied by the Bulgarian instruments and systems. Both satellites have a relatively long lifespan, which means several years of work on the results. The initial result, however, is already clear: in the course of these few years of dedicated work, a Bulgarian-Soviet scientific and technical collective was developed which, according to senior Soviet personnel, can resolve any problem related to outer space around the earth.

5003
CSO: 2202/22

NEW TECHNOLOGY FOR IMPLANTING METALS IN PLASTIC MATERIALS OUTLINES

Sofia ANTENI in Bulgarian 12 Aug 81 p 3

[Article by Georgi Georgiev: "Through Ion Implantation"]

[Text] For the First Time in the World

"Method for surface modification of synthetic, artificial and natural polymer compositions with metals, metalloids and gases." Authors: Scientific Associate Kol'o Kolev, Rosen Yankov, physicist; Scientific Associate Engineer Asen Dzhakov; Senior Scientific Associate and Candidate of Physical Sciences Blagoy Amov, Stoyan Stoyanov, from the Institute of Nuclear Research and Nuclear Power Engineering of the Bulgarian Academy of Sciences, and Senior Scientific Associate and Candidate of Chemical Sciences Lily Feeva, Institute for the Treatment of Plastics.

Last May this method took first place in the "Invention of the Month" competition. This is a guarantee that its scientific and economic contribution will be unquestionable. Few readers would have an idea of the nature of the invention from its name, for which reason we shall explain it:

It is a question of a modification (change) of the surface of substances, in the course of which they acquire new properties. A particular alloy is obtained through diffusion or introduction (implantation) of ions. The ion implantation method was discovered 20 years ago and in recent years studies have been focused on the interaction between accelerated ions and semiconductors and metals. This is being used ever more extensively in modern semiconductor microelectronics.

All of us know that plastics are used to replace metals and that in some cases they are not only as strong and elastic as metals but are even preferable because of their lighter weight and resistance to corrosion.

But could plastics become conductors and replace precious metals? Could our clothing be lined with a fine metal sheet? These strange questions were answered by a group of authors headed by Scientific Associate Kol'o Kolev.

"There are chemical means for metalizing plastics. However, regardless of how thick the cover is, it may peel off. Furthermore, the manufacturing processes are difficult to control and are inaccurate. How are ions of metals, metalloids and gases implanted in synthetic, artificial and natural compositions?"

"All that we need," said Rosen Yankov, a 30-year-old physicist, "is an ion-radiating system which will emit ions whose acceleration to the target will be controlled. In this case, the target is the object, the organic matter on whose surface we would like to develop entirely new qualities. The direction in which such qualities will change depends on the amount of energy, the chemical element whose ions are used and the type of polymer. The accelerated ions forcefully penetrate at a determined depth and a molecular alloy and a fine stratum with a thickness not exceeding a fraction of a micron is obtained. This surface remains virtually unaffected by mechanical influences such as crushing, folding, friction, or washing.... Unlike the use of chemical methods, there is no need to process the surface in advance and apply various binding lacquers. The method thus makes it possible to introduce a precisely dosed quantity of virtually any chemical element."

"It would be difficult as of now to indicate all industrial areas in which the Bulgarian method may be used. Nevertheless, ..."

Kol'o Kolev's answer:

"When Hertz discovered radio waves he had no idea of their future use or economic effect. It is difficult to determine the economic effect of our invention. On the basis of our studies we claim that it will be possible to develop fine metal conductor strata on plastics, surfaces with heat and light reflecting properties and special clothing. Metallized polymer surfaces will be used in medicine, construction, solar power engineering, household needs, microelectronics and the semiconductor industry. They will certainly be useful in other areas as well."

Naturally, not everyone can give advice as to how to make the best use of this contribution by Bulgarian scientists. However, there are interested departments in charge of proving practically and promptly that in this case this economic contribution will be unquestionable and promising.

5003
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BRIEFS

HIGHER PLANT YIELD DISCOVERY--Scientists at the Institute of Microbiology, Czechoslovak Academy of Sciences (CSAV), have developed a remarkable method of increasing wheat and sugar beet yield. Based on so-called bacterization of seeds, this unique method has resulted from a study of interaction of phytopathogenic fungi and its accompanying bacteria. The process is based on topical application of selected bacteria cells on seeds, creating suitable conditions for their growth. The outcome is lower occurrence of root disease caused by phytopathogenic fungi, which consequently increases plant yield by 5 to 10 percent. The favorable effect of bacterization is supported by application of organic fertilizers and urea to the plants. The CSAV scientists and experts from the Experimental Institute of Plant Production have been involved in the next phase of the research aimed at practical application of this method. [Prague ZEMEDELSKE NOVINY in Czech 9 Oct 81 p 4]

CSO: 2402/3

ENHANCED NITROGEN FIXATION SOUGHT THROUGH GENETIC ENGINEERING

Budapest MAGYAR HIRLAP in Hungarian 27 Sep 81 p 11

[Summary] To overcome the costs and damage caused by growing use of synthetic nitrogen fertilizers, researchers are attempting to identify the genes or discover the mechanism which determines symbiotic nitrogen fixation. Hungarian scientists working at the Institute of Genetics of the Szeged Biological Center have already attained notable results in this work. Institute work is under the direction of Adam Kondorosi who describes it as follows:

"We investigated Rhizobium meliloti which has a symbiotic relationship with alfalfa. To obtain the genes we were seeking, we created through mutation forms incapable of symbiosis; this was how we identified the genes to be investigated. The next step was to locate in the chromasomes the genes somehow responsible for nitrogen fixation and whose properties had been damaged through mutation.

"We began this work in 1976 and succeeded in making the first genetic map of the rhizobium chromasome at the same time as a British and an American laboratory. We were the first in the world to do this in the case of the meliloti species. Also, in the case of this species of bacteria, we and other research groups arrived at the structure of certain genes through genetic engineering. We described the sequence of amino acids in the case of one of the proteins of the enzymes responsible for nitrogen reduction; we succeeded in isolating some genes which encode nitrogen fixation, the formation of nodes. Results indicate that most of these genes are located on a plasmide of a separate DNA molecule rather than on the chromasome of the bacterium. In any event, this piece of DNA which is outside the chromasome or rather its gene can be transferred from one rhizobium to another and thereby create hybrids capable of symbiosis with other plants. This was first achieved by a British laboratory. We, too, prepare such improved forms.

"Our work is supported by the Protein Program Office of the National Technical Development Committee. A research association has been formed with the cooperation of several institutions interested in this theme. Its purpose is to provide the farms with more effective rhizobium innoculating material.

"Within the next year or two we, in Hungary, will probably be able to combine properties useful in nitrogen fixation in a hybrid rhizobium. Through our own and foreign research we will acquire theoretical knowledge which will enable us to state how nitrogen fixing genes can be transferred to papilionaceous plants in such a way that they will be accepted, also to learn which plants will accept them."

CSO: 2502/1

MICROELECTRONICS FACING UNCERTAIN FUTURE IN HUNGARY

Budapest FIGYELO in Hungarian 30 Sep 81 p 9

[Excerpts] The propagation of microelectronics has been characterized by indecisiveness and inaction in Hungary and this threatens the country's economic-technical standards. In the following discussion the uncertainty of future microelectronics is revealed through the views of two specialists: Ferenc Banyai, managing director of the Communications Engineering Industrial Research Institute [HIKI], and Gyula Boglar, department head of the Development Institute of the Telephone Factory.

Concerning the supply of microelectronic items, Banyai says, "Speaking charitably, we can say that parts production has attained the technical level of 1965. Yet the extent of the lag is hard to measure since some places boast quite modern equipment. Yet a complete, operation-ready production line exists nowhere in the country. Although HIKI, for example, spent 400 million forints on investments in this field, it lacks production equipment which is uniform in capacity and technical standards. The same lack of uniformity holds true for the Institute's specialists. All this leaves out of consideration the lack of the type of infrastructure required by the technology of active element production: very pure water, oxygen, nitrogen, even temperature, ventillation. Practically all the requirements for making microelectronic parts are unmet.

"Let us not forget that achievements in this field have resulted from the orders placed by the armed forces throughout the world. Thus pilot plant production and testing are overtly or covertly subsidized. This has not happened in our country. To this day the industry has not received investment and development opportunities on which it could build."

According to Boglar, branches of industry other than microelectronics enjoyed priority in the former Ministry of Metallurgy and Machine Industry. No central development program was set up for microelectronics. "Lack of development in this field threatens the international competitiveness of our electronics industry the production value of which now amounts to an annual several 10 billion forints."

"Lack of a unified concept," Banyai resumes, "has led to a peculiar distribution of roles: HIKI fabricates hybrid circuits at virtually industrial level on a production line suited mainly for pilot plant production. Production is naturally quite costly, but even so we cannot meet domestic demand. We prefer to produce circuits designed to order rather than make so-called 'basic' circuits. Yet, as the Telephone Factory representative can confirm, even the former can be obtained more cheaply from abroad."

Boglar agrees with this, stating that his factory now buys from Great Britain. Banyai adds that in many cases HIKI produced [circuits?] instead of the Remix Radio Engineering Enterprise. He then states: "As a result of concerted action by the Associations of Communications, Automation and Transport, there is now a program office, an inter-portfolio committee and a government committee on microelectronics. A decision is being formulated. However, it is 15 years late. Even with a go-ahead decision, it will be 1985-1986 before there can be any production."

In response to a question concerning the main current trends in view of previous results, Boglar replied: "As a user, I am against mass production of parts. Professional installations bring a better price on the world market. Parts should be purchased abroad. Fabrication of circuitry destined for incorporation in installations is preferable. We must aim to make installations which are smaller, less energy demanding and more reliable."

Speaking from the viewpoint of HIKI, Banyai says, "I feel that if we succeed in acquiring a smooth-running production line operating with MOS technology and having an annual capacity of 40,000 chips,...we will be able to produce an industrial level and meet rapidly growing domestic demand for installation-oriented circuits provided that suitable circuitry planning systems exist."

When asked whether, granted the need to use microelectronics in domestic investments and in production of installations, it was essential for Hungary to make parts rather than buy them elsewhere in Europe, Banyai replied: "This is a great dilemma. To this should be added that all the socialist countries, ranging from the GDR to Bulgaria, have implemented tremendous investments in this field. Furthermore, total imports of such items from capitalist countries amount to no more than 18 million-20 million dollars a year. This is not such a vast figure. However, market experience teaches us that, due partly to the embargo and to current shortcomings in CEMA cooperation, we cannot rely completely on imports. If we wish to buy from CEMA, we must be ready to offer to export something in return because of the bilaterialism in the subbranch. In the eyes of the bank, we are not competitive. Yet the competitiveness of Hungarian industry and its ability to deliver depend largely on this: If we are unable to incorporate microelectronics into our products, they will sell neither in the East nor the West."

CSO: 2502/3

BRIEFS

IONIZING RADIATION MEASURING DEVICE—Calibration of dosimetering instruments used in practice is performed by measuring them against secondary etalons derived from the national etalon. Jozsef Hizo, department head of the National Scaling Office, has invented a device for measuring ionizing radiation. The device improves accuracy and broaden the range of measurement. Quantities which require measurement differ widely by as much as eight orders of magnitude. The secondary etalons derived for this purpose consist of an ionizing chamber in which electric current is generated by radiation. This can be measured only by an extremely sensitive meter: current having a strength of 10^{-12} amperes must be measured to an accuracy of a tenth of a percent. Hizo's researches, conducted in the field of applied physics led to development of the ionizing chamber. The chamber had to be capable of measuring radiation doses of varying intensity with equal accuracy. It was important for the chamber not to be extremely energy dependent, to be stable and capable of measuring small doses such as are important in environmental protection. The new ionzing chambers have been fabricated a variety of sizes: 0.3, 40 and 1,400 milliliters. A 10,000-milliliter version is now being prepared. A large Austrian semi-government research institute has purchased the right to use the patent and develop it. There have even been talks about joint fabrication and sales. The invention has been patented and talks are under way concerning patents in Austria, the U.S.A. and the Common Market countries. [Budapest NEPSZABADSAG in Hungarian 15 Sep 81 p 8]

CSO: 2502/2

SCIENTIFIC-TECHNICAL CONGRESS STRESSES ITS CONSULTANT ROLE

Warsaw TRYBUNA LUDU in Polish 18 Sep 81 p 4

[Interview with Bogdan Kumat, secretary general of the Chief Technical Organization (NOT), by Andrezej Konieczny; date and place not specified]

[Text] [Question] How many engineers are there in Poland, and what is the percentage of members in scientific-technical associations?

[Answer] The Federation of Scientific-Technical Associations within the Chief Technical Organization (NOT) has over 550,000 members. There are over 200,000 engineers in the federation. However, this constitutes only about 50 percent of all engineers in the national economy.

[Question] Do you not think that genuine activation of this intellectual potential could contribute to bringing the economy out of this crisis more quickly and effectively than is shown in the boldest prognoses? After all, the resourcefulness of Polish engineers is well known, and it is therefore laughable that problems like a lack of gaskets and spare parts should exist, along with frequent breakdowns in entire plants and industrial branches.

[Answer] Of course. They testify to the hitherto existing achievements of the engineering and technical community in technical progress, which exerts an influence on the ultimate results of economic activity. Widely known are the names of Polish engineers who have written themselves forever in the history of economic development in our country.

Let's Organize Anti-Crisis Committees at Our Plants

We are also currently aware of the large role required to bring the economy out of this crisis, as well as to remedy and stabilize it. This is why we must be very active in our community, especially in the plants where the primary goal is to correct the supply of raw materials and energy, along with maximal utilization of production strength.

Above all, we have instructed all scientific-technical associations and our sections and committees to undertake crisis action. We would like each plant to have an anti-crisis committee that would be able to work out programs to take advantage of every resource at an enterprise's disposal. This concerns not only raw material resources, lasting measures and so on, but also taking advantage of the knowledge and experiences of engineers and technicians belonging to scientific-technical associations (SNT).

[Question] What conditions cause this authentic activation within the community of Polish engineers and technicians? Why has this not happened previously?

[Answer] The widely understood activation of engineers and technicians is dependent above all on the right choice for guiding the development of the Polish economy, which is closely tied to acceptance of the most favorable variable for economic reform. We have worked out and shown the state authorities the opinion and position of engineers and technicians regarding this issue. Our community is now awaiting some quick decisions. Prolonged work on the final shape of reform was one of the reasons for less than rapid joining by the engineering and technical community in the activity designed to get the economy out of this difficult situation. The fact is that many of our proposals were lost. This is the source of disbelief that we have to conquer.

Credibility of Work

[Question] What does NOT aim to do to bring about this activation? Will NOT's authority in this aim be credible to the membership of SNT?

[Answer] We wish to base the community's activation on the credibility of action by the entire federation. It will depend primarily on the independence and efficiency of actions. We must achieve a situation whereby specialists from SNT will prepare projects, reports and opinions that will be utilized in full during important economic decision-making. We feel that we should obtain the role of public consultant as regards the proper directions for the development of Polish technology. We have at our disposal an enormous pool of specialists with the highest qualifications in various fields. This is why we are able to take on such a task.

I also can assure you that material worked out by us will be completely objective and in accordance with the spirit of independence, which the membership of SNT has so strongly stipulated.

[Question] What are NOT's relations with "Solidarity"?

[Answer] The federation of SNT and NOT views cooperation with the independent trade union (NSZZ) "Solidarity" as paramount. There are many fields in which such cooperation is particularly desirable. We should cooperate in the matter of developing individual industrial branches and plants, and also in taking advantage of scientific-technical associations at the plants. This concerns primarily cooperation which deals with technical corrections in working conditions for personnel, their social and living situation and so forth.

The proposal for cooperation has already been sent to "Solidarity's" National Consultative Commission (KKP). I think there will be shortly a meeting with representatives from "Solidarity" on this matter. We also have invited representatives from "Solidarity's" KKP to participate in the Organizational Committee for the Eighth Congress of Polish Technicians.

[Question] How do you see the role of your associates in the new autonomous organs?

Expert Assistance for Autonomous Organs

[Answer] SNT and NOT should be above all an advisor to labor autonomous organs in resolving numerous problems with which the plants struggle, especially in the area of rational actions by the enterprises. I think that the expert opinions of experienced engineers and technicians will be utilized to establish programs and production tasks for plants. Some associations already have declared themselves to be labor autonomous organs, counting that this initiative will meet with full recognition.

[Question] How is the upcoming Congress of Polish Technicians supposed to be different--and it should be--from previous congresses?

[Answer] Congresses of Polish Technicians have a long tradition. Important and meaningful opinions as regards the directions of economic development in Poland frequently have been established at them. However, not every congress played such a role. There were also some congresses that limited themsleves to defining the means by which to implement previously established directions for economic and industrial development. Of course, they did not fulfill the broad expectations of our members, which caused widespread disenchantment.

We hope that the Eighth Congress of Polish Technicians, which will take place 6-8 November 1981 in Lodz, will link itself to the best traditions of preceding congresses. We aim, besides passing concrete and realistic resolutions, to fulfill the fundamental expectations of all members of SNT, who count on compliance with their opinions and positions dealing with various fields of life in Poland.

The Congress's resolutions should become the creative material for those persons who will make the basic decisions about the development of the Polish economy.

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